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CLAIMS

The claims defining the invention are as follows:

1. A surgical device for treating tissue, comprising:
 - 5 a catheter;
 - a helical fastening needle for fastening the end of said catheter to tissue;
 - means for deploying and retracting said helical fastening needle from and into an end of said catheter;
 - a shaft disposed within a lumen of said catheter;
- 10 a needle-like member coupled to said shaft capable of extending from the end of the catheter through said helical fastening needle into tissue and being retracted into the end of said catheter using said shaft.
2. The surgical device according to claim 1, wherein said deploying and retracting means comprise a shape memory alloy wire.
- 15 3. The surgical device according to claim 2, wherein said helical fastening needle is part of said shape memory alloy wire.
4. The surgical device according to claim 2 or 3, wherein said shape memory alloy wire is made from a nickel-titanium alloy.
5. The surgical device according to claim 3, wherein said catheter has a second lumen, said shape memory alloy wire being disposed within said second lumen if said helical fastening needle is retracted.
- 20 6. The surgical device according to claim 2, wherein said deploying and retracting means comprises another catheter of smaller diameter coupled to said catheter, said shape memory alloy wire disposed within a lumen of said other catheter.
- 25 7. The surgical device according to claim 1, wherein said deploying and retracting means comprises another catheter of small diameter disposed within a lumen of said outer catheter, said helical fastening needle coupled to said other catheter capable of rotation about a longitudinal axis of said other catheter.
8. The surgical device according to claim 7, wherein said needle-like member and said shaft are disposed in the lumen of said other catheter.

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9. The surgical device according to claim 1, wherein said needle-like member is hollow and is capable of delivering a liquid to irrigate the needle-like member.

10. The device according to claim 1, wherein said needle-like member comprises an electrode for delivering electromagnetic energy to thermally ablate tissue.

11. The device according to claim 10, further wherein said needle-like member comprises means for measuring the temperature of at least a portion of said needle-like member.

10 12. The device according to claim 10, further wherein said needle-like member comprises means for measuring electrical activity from and pacing nearby tissue through multiple ring-like electrodes attached to the exterior of said needle-like member.

13. A method for surgically treating tissue, comprising:
15 positioning a catheter adjacent tissue, said catheter comprising a helical fastening needle for fastening the end of said catheter to tissue;
deploying said helical fastening needle from said catheter into tissue to fasten said catheter to tissue;
extending from the end of said catheter a needle-like member coupled to a
20 shaft through said helical fastening needle into tissue.

14. The method according to claim 13, further comprising the step of retracting said needle-like member into the end of said catheter using said shaft.

15. The method according to claim 14, further comprising the step of retracting said helical fastening needle into the end of said catheter.

25 16. The surgical method according to claim 13, wherein said helical fastening needle is part of said shape memory alloy wire.

17. The surgical method according to claim 16, wherein said shape memory alloy wire is made from a nickel-titanium alloy.

18. The surgical method according to claim 16, wherein said catheter has a
30 second lumen, said shape memory alloy wire being disposed within said second lumen if said helical fastening needle is retracted.

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19. The surgical method according to claim 16, wherein another catheter of smaller diameter is coupled to said catheter, said shape memory alloy wire being disposed within a lumen of said other catheter.

20. The surgical method according to claim 13, wherein another catheter of small diameter is disposed within a lumen of said outer catheter, said helical fastening needle coupled to said other catheter capable of rotation about a longitudinal axis of said other catheter.

21. The surgical method according to claim 20, wherein said needle-like member and said shaft are disposed in the lumen of said other catheter.

22. The surgical method according to claim 13, wherein said needle-like member is hollow and further comprising the step of delivering a liquid using said needle-like member to irrigate said needle-like member.

23. The method according to claim 13, further comprising the step of delivering electromagnetic energy using said needle-like member to thermally ablate tissue.

24. The method according to claim 23, further comprising the step of measuring the temperature of at least a portion of said needle-like member.

25. The method according to claim 23, further comprising the step of measuring electrical activity from and pacing nearby tissue through multiple ring-like electrodes attached to the exterior of said needle-like member.

26. A surgical device for treating tissue, comprising:
an outer elongate member with a lumen formed therethrough;
an inner elongate member with a lumen formed therethrough, said inner elongate member disposed within said lumen of said outer elongate member and capable of rotation about a longitudinal axis of said inner elongate member;
a helical fixing member coupled at a distal end of said inner elongate member capable of extending from and retracting into said outer elongate member for screw-in type engagement with said tissue to connect a distal end of said outer elongate member with said tissue; and

30 a needle-like member disposed within a portion of said lumen of said inner elongate member capable of being extended from and retracted into an end of said

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elongate member, said needle-like member capable of being extended concentrically through said helical fixing member into said tissue.

27. The device according to claim 26, wherein said outer elongate member is a catheter.

5 28. The device according to claim 26, wherein said inner elongate member is a catheter.

29. The device according to claim 26, wherein said needle-like member is hollow and is capable of delivering a liquid to irrigate the needle-like member.

10 30. The device according to claim 26, wherein said helical fixing member is made of metal.

31. The device according to claim 26, further comprising a conductor passing through said lumen of said inner elongate member and connected with an electrode of said needle-like member for delivering electromagnetic energy for thermal ablation.

15 32. The device according to claim 31, further wherein said needle-like member further comprises means for measuring the temperature of at least a portion of said needle-like member.

20 33. The device according to claim 31, further wherein said needle-like member further comprises means for measuring electrical activity from and pacing the nearby tissue through multiple ring-like electrodes attached to the exterior of said needle-like member.

34. The device according to claim 26, further comprising an irrigation tube located within said needle-like member, wherein said needle-like member has at least one outlet hole for releasing irrigation liquid.

25 35. The device according to claim 26, further comprising an ultrasound sensing device located within said needle-like member.

36. The device according to claim 26, further comprising a valve between said outer and inner elongate members.

30 37. The device according to claim 26, further comprising a valve between said inner elongate member and said needle-like member.

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38. The device according to claim 26, further comprising a pull wire connected to a metal ring attached to the distal portion of said outer elongate member.

39. The device according to claim 26, wherein said needle-like member has an outlet adjacent an end of said needle-like member for delivering a substance to
5 the tissue.

40. The device according to claim 26, further comprising a plurality of temperature sensing or measuring devices attached said needle-like member and arranged at intervals to enable sensing or monitoring of temperature at a plurality of tissue depths.

10 41. A surgical method for treating tissue, said method comprising the steps of:

positioning an outer elongate member with a lumen formed therethrough adjacent said tissue;

15 providing an inner elongate member with a lumen formed therethrough, said inner elongate member disposed within said lumen of said outer elongate member and capable of rotation about a longitudinal axis of said inner elongate member;

20 twisting a helical fixing member coupled at a distal end of said inner elongate member capable of extending from and retracting into said outer elongate member for screw-in type engagement with said tissue to connect a distal end of said outer elongate member with said tissue for engagement with said tissue; and

deploying into said tissue a needle-like member disposed within a portion of said lumen of said inner elongate member capable of being extended from and retracted into an end of said elongate member, said needle-like member capable of being extended concentrically through said helical fixing member into said tissue.

25 42. The method according to claim 41, wherein said outer elongate member is a catheter.

43. The method according to claim 41, wherein said inner elongate member is a catheter.

30 44. The method according to claim 41, wherein said needle-like member is hollow and is capable of delivering a liquid to irrigate said needle-like member.

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45. The method according to claim 41, further comprising the step of delivering said liquid via said needle-like member to cool the tissue electrode interface.

46. The method according to claim 41, wherein said helical fixing member is made of metal.

47. The method according to claim 41, wherein said tissue is located in the heart or another organ that can be reached through the vasculature, a hollow organ such as the intestine or through a cavity such as but not limited to the peritoneal space or thoracic cavity.

48. The method according to claim 41, further comprising the step of delivering electromagnetic energy to said needle-like member for thermal tissue ablation via a conductor passing through said lumen and connected with an electrode of said needle-like member.

49. The method according to claim 48, further comprising the step of measuring the temperature of at least a portion of said needle-like member.

50. The method according to claim 41, wherein a valve is provided between said outer and inner elongate members.

51. The method according to claim 41, wherein a pull wire attached to a metal ring located in the distal section of said outer elongate member is provided.

52. The method according to claim 51, further comprising the step of using the pull wire to flex and deflex the outer elongate member, enabling the outer elongate member to be positioned at the region of interest.

53. The method according to claim 41, wherein a valve is provided between said inner elongate member and said needle-like member.

54. The method according to claim 41, further comprising the step of judging the depth that said needle-like member is to be inserted into said tissue using an ultrasound sensing device located within said needle-like member.

55. The method according to claim 41, wherein said positioning step involves using a pull wire attached to a distal ring to flex and deflex said outer elongate member as required.

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56. The method according to claim 41, wherein said needle-like member has an outlet adjacent an end of said needle-like member for delivering a substance to the tissue.

57. The method according to claim 41, further comprising the step of sensing or monitoring temperature at a plurality of tissue depths using a plurality of temperature sensing or measuring devices attached said needle-like member and arranged at intervals.

58. A surgical device for treating tissue, comprising:
an outer elongate member with a lumen formed therethrough;
10 a shape memory alloy wire disposed within a further lumen and having a helical shape at one end if extended from the end of said outer elongate member for screw-in type engagement with said tissue to connect said end of said outer elongate member with said tissue;
a needle-like member; and
15 an inner elongate member coupled to said needle-like member disposed within said lumen, said needle-like member capable of being extended from an end of said outer elongate member concentrically through a helical portion of said shape memory alloy wire into said tissue.

59. The device according to claim 58, wherein said outer elongate member 20 is a catheter.

60. The device according to claim 58, wherein said inner elongate member is a catheter.

61. The device according to claim 58, wherein said needle-like member is hollow and is capable of delivering a liquid to irrigate the needle-like member.

25 62. The device according to claim 59, further comprising a conductor passing through said lumen of said inner elongate member and connected with an electrode of said needle-like member for delivering electromagnetic energy for thermal ablation.

63. The device according to claim 62, further wherein said needle-like 30 member further comprises means for measuring the temperature of at least a portion of said needle-like member.

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64. The device according to claim 62, further wherein said needle-like member further comprises means for measuring electrical activity from and pacing the nearby tissue through multiple ring-like electrodes attached to the exterior of said needle-like member.

5 65. The device according to claim 58, further comprising an irrigation tube located within said needle-like member, wherein said needle-like member has at least one outlet hole for releasing irrigation liquid.

66. The device according to claim 58, further comprising an ultrasound sensing device located within said needle-like member.

10 67. The device according to claim 58, further comprising a valve between said outer and inner elongate members.

68. The device according to claim 58, further comprising a valve between said inner elongate member and said needle-like member.

15 69. The device according to claim 58, further comprising a pull wire connected to a metal ring attached to the distal portion of said outer elongate member.

70. The device according to claim 58, wherein said needle-like member has an outlet adjacent an end of said needle-like member for delivering a substance to the tissue.

20 71. The device according to claim 58, further comprising a plurality of temperature sensing or measuring devices attached said needle-like member and arranged at intervals to enable sensing or monitoring of temperature at a plurality of tissue depths.

72. The device according to claim 58, wherein said outer elongate member is formed by extruding to provide said lumen and said further lumen.

25 73. The device according to claim 58, further comprising another elongate member attached to said outer elongate member, said other elongate member having said further lumen.

74. The device according to claim 58, wherein said shape memory alloy wire is made of a nickel-titanium alloy.

30 75. A surgical method for treating tissue, said method comprising the steps of:

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positioning an outer elongate member with a lumen formed therethrough adjacent said tissue;

extending a shape memory alloy wire disposed within a further lumen and having a helical shape at one end if extended from the end of said outer elongate member for screw-in type engagement with said tissue to connect said end of said outer elongate member with said tissue; and

5 deploying into said tissue a needle-like member coupled to an inner elongate member disposed within said lumen, said needle-like member capable of being extended from an end of said outer elongate member concentrically through a helical portion of said shape memory alloy wire into said tissue.

10 76. The method according to claim 75, wherein said outer elongate member is a catheter.

15 77. The method according to claim 75, wherein said inner elongate member is a catheter.

78. The method according to claim 75, wherein said needle-like member is hollow, and further comprising the step of delivering a liquid to irrigate the needle-like member.

20 79. The method according to claim 76, wherein a conductor passes through said lumen of said inner elongate member and is connected with an electrode of said needle-like member, and further comprising the step of delivering electromagnetic energy for thermal ablation via said electrode.

80. The method according to claim 79, further comprising the step of measuring the temperature of at least a portion of said needle-like member.

25 81. The method according to claim 79, further comprising the step of measuring electrical activity from and pacing the nearby tissue through multiple ring-like electrodes attached to the exterior of said needle-like member.

82. The method according to claim 75, wherein an irrigation tube is located within said needle-like member, said needle-like member having at least one outlet hole for releasing irrigation liquid.

30 83. The method according to claim 75, wherein an ultrasound sensing device is located within said needle-like member.

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84. The method according to claim 75, wherein said needle-like member has an outlet adjacent an end of said needle-like member, and further comprising the step of delivering a substance to the tissue via said outlet.

85. The method according to claim 75, wherein a plurality of temperature sensing or measuring devices are attached said needle-like member and arranged at intervals, and further comprising the step of sensing or monitoring temperature at a plurality of tissue depths using said plurality of temperature sensing or measuring devices.

86. The method according to claim 75, wherein said outer elongate member is formed by extruding to provide said lumen and said further lumen.

87. The method according to claim 75, wherein another elongate member is attached to said outer elongate member, said other elongate member having said further lumen.

88. The method according to claim 75, wherein said shape memory alloy wire is made of a nickel-titanium alloy.

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